

BOTTOM, STRANGE MESONS

($B = \pm 1, S = \mp 1$)

$$B_s^0 = s\bar{b}, \bar{B}_s^0 = \bar{s}b, \quad \text{similarly for } B_s^{*'}\text{'s}$$

NODE=MXXX046

 B_s^0

$$I(J^P) = 0(0^-)$$

NODE=S086

I, J, P need confirmation. Quantum numbers shown are quark-model predictions.

$$\text{Mass } m_{B_s^0} = 5366.77 \pm 0.24 \text{ MeV}$$

$$m_{B_s^0} - m_B = 87.35 \pm 0.23 \text{ MeV}$$

$$\text{Mean life } \tau = (1.516 \pm 0.011) \times 10^{-12} \text{ s}$$

$$c\tau = 454.5 \text{ } \mu\text{m}$$

$$\Delta\Gamma_{B_s^0} = \Gamma_{B_{sL}^0} - \Gamma_{B_{sH}^0} = (0.081 \pm 0.011) \times 10^{12} \text{ s}^{-1}$$

B_s^0 - \bar{B}_s^0 mixing parameters

$$\Delta m_{B_s^0} = m_{B_{sH}^0} - m_{B_{sL}^0} = (17.69 \pm 0.08) \times 10^{12} \text{ } \hbar \text{ s}^{-1}$$

$$= (1.164 \pm 0.005) \times 10^{-8} \text{ MeV}$$

$$x_s = \Delta m_{B_s^0} / \Gamma_{B_s^0} = 26.82 \pm 0.23$$

$$\chi_s = 0.499309 \pm 0.000012$$

CP violation parameters in B_s^0

$$\text{Re}(\epsilon_{B_s^0}) / (1 + |\epsilon_{B_s^0}|^2) = (-4.3 \pm 1.4) \times 10^{-3}$$

$$\text{CP Violation phase } \beta_s = (4^{+10}_{-13}) \times 10^{-2}$$

$$A_{CP}(B_s \rightarrow \pi^+ K^-) = 0.29 \pm 0.07$$

$$A_{CP}(B_s^0 \rightarrow [K^+ K^-]_D \bar{K}^*(892)^0) = 0.04 \pm 0.16$$

These branching fractions all scale with $B(\bar{b} \rightarrow B_s^0)$.

The branching fraction $B(B_s^0 \rightarrow D_s^- \ell^+ \nu_\ell \text{ anything})$ is not a pure measurement since the measured product branching fraction $B(\bar{b} \rightarrow B_s^0) \times B(B_s^0 \rightarrow D_s^- \ell^+ \nu_\ell \text{ anything})$ was used to determine $B(\bar{b} \rightarrow B_s^0)$, as described in the note on " B^0 - \bar{B}^0 Mixing"

For inclusive branching fractions, e.g., $B \rightarrow D^\pm \text{ anything}$, the values usually are multiplicities, not branching fractions. They can be greater than one.

NODE=S086M;DTYPE=M

NODE=S086DM;DTYPE=D

NODE=S086T;DTYPE=T;OUR EVAL;

→ UNCHECKED ←
NODE=S086C1A;DTYPE=C;OUR EVAL

NODE=S086DGS;DTYPE=w;OUR EVAL;

→ UNCHECKED ←

CLUMP=Y

NODE=S086D;DTYPE=y;CLUMP=Y;OUR

EVAL;→ UNCHECKED ←
NODE=S086D1;DTYPE=y;CLUMP=Y;OUR

EVAL

NODE=S086DG;DTYPE=y;CLUMP=Y;OUR

EVAL;→ UNCHECKED ←

NODE=S086CHS;DTYPE=y;CLUMP=Y;

OUR EVAL;→ UNCHECKED ←

CLUMP=C

NODE=S086EPS;DTYPE=v;CLUMP=C;

OUR EVAL;→ UNCHECKED ←

NODE=S086PHS;DTYPE=v;CLUMP=C;

OUR EVAL;→ UNCHECKED ←

NODE=S086CP1;DTYPE=v;CLUMP=C

NODE=S086CP2;DTYPE=v;CLUMP=C

NODE=S086215;NODE=S086

B_s^0 DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)	
D_s^- anything	(93 ± 25) %		—	DESIG=8
$\ell \nu_\ell X$	(9.5 ± 2.7) %		—	DESIG=49
$D_s^- \ell^+ \nu_\ell$ anything	[a] (7.9 ± 2.4) %		—	DESIG=4
$D_{s1}(2536)^- \mu^+ \nu_\mu$, $D_{s1}^- \rightarrow D^{*-} K_S^0$	(2.6 ± 0.7) × 10 ⁻³		—	DESIG=36
$D_{s1}(2536)^- X \mu^+ \nu$, $D_{s1}^- \rightarrow \bar{D}^0 K^+$	(4.3 ± 1.7) × 10 ⁻³		—	DESIG=46
$D_{s2}(2573)^- X \mu^+ \nu$, $D_{s2}^- \rightarrow \bar{D}^0 K^+$	(2.6 ± 1.2) × 10 ⁻³		—	DESIG=47
$D_s^- \pi^+$	(3.04 ± 0.23) × 10 ⁻³		2320	DESIG=5
$D_s^- \rho^+$	(7.0 ± 1.5) × 10 ⁻³		2248	DESIG=39
$D_s^- \pi^+ \pi^+ \pi^-$	(6.3 ± 1.1) × 10 ⁻³		2301	DESIG=32
$D_{s1}(2536)^- \pi^+$, $D_{s1}^- \rightarrow D_s^- \pi^+ \pi^-$	(2.5 ± 0.8) × 10 ⁻⁵		—	DESIG=58
$D_s^\mp K^\pm$	(2.03 ± 0.28) × 10 ⁻⁴	S=1.3	2293	DESIG=37

$D_s^- K^+ \pi^+ \pi^-$		$(3.3 \pm 0.7) \times 10^{-4}$		2249	DESIG=57
$D_s^+ D_s^-$		$(5.3 \pm 0.8) \times 10^{-3}$		1824	DESIG=33
$D_s^{*-} \pi^+$		$(2.0 \pm 0.5) \times 10^{-3}$		2265	DESIG=40
$D_s^{*-} \rho^+$		$(9.7 \pm 2.2) \times 10^{-3}$		2191	DESIG=41
$D_s^{*+} D_s^- + D_s^{*-} D_s^+$		$(1.30 \pm 0.22) \%$	S=1.1	1742	DESIG=34
$D_s^{*+} D_s^{*-}$		$(1.87 \pm 0.30) \%$		1655	DESIG=35
$D_s^{(*)+} D_s^{(*)-}$		$(4.5 \pm 1.4) \%$		-	DESIG=24
$\bar{D}^0 \bar{K}^*(892)^0$		$(4.7 \pm 1.4) \times 10^{-4}$		2264	DESIG=48
$\bar{D}^0 K^+ K^-$		$(4.2 \pm 1.9) \times 10^{-5}$		2242	DESIG=51
$J/\psi(1S) \phi$		$(10.0 \pm 3.2) \times 10^{-4}$		1588	DESIG=7
$J/\psi(1S) \pi^0$		$< 1.2 \times 10^{-3}$	CL=90%	1786	DESIG=21
$J/\psi(1S) \eta$		$(4.0 \pm 0.7) \times 10^{-4}$	S=1.3	1733	DESIG=22
$J/\psi(1S) K_S^0$		$(2.1 \pm 0.6) \times 10^{-5}$	S=2.1	1743	DESIG=44
$J/\psi(1S) K^*(892)^0$		$(4.4 \pm 0.9) \times 10^{-5}$		1637	DESIG=45
$J/\psi(1S) \eta'$		$(3.4 \pm 0.5) \times 10^{-4}$		1612	DESIG=50
$J/\psi(1S) \pi^+ \pi^-$		$(2.0 \pm 0.6) \times 10^{-4}$		1775	DESIG=52
$J/\psi(1S) f_0(980), f_0 \rightarrow \pi^+ \pi^-$		$(1.29 \pm 0.40) \times 10^{-4}$		-	DESIG=42
$J/\psi(1S) f_0(1370), f_0 \rightarrow \pi^+ \pi^-$		$(3.9 \pm 0.9) \times 10^{-5}$		-	DESIG=43
$J/\psi(1S) f_2(1270), f_2 \rightarrow \pi^+ \pi^-$		$(10 \pm 5) \times 10^{-7}$		-	DESIG=53
$J/\psi(1S) \pi^+ \pi^-$ (nonresonant)		$(1.7 \pm 1.1) \times 10^{-5}$		1775	DESIG=54
$J/\psi(1S) f_2'(1525)$		$(2.6 \pm 0.9) \times 10^{-4}$		1304	DESIG=56
$\psi(2S) f_2'(1525)$		$(2.1 \pm 1.0) \times 10^{-4}$		587	DESIG=55
$\psi(2S) \phi$		$(5.0 \pm 1.6) \times 10^{-4}$		1120	DESIG=6
$\pi^+ \pi^-$		$(7.6 \pm 1.9) \times 10^{-7}$	S=1.4	2680	DESIG=16
$\pi^0 \pi^0$		$< 2.1 \times 10^{-4}$	CL=90%	2680	DESIG=14
$\eta \pi^0$		$< 1.0 \times 10^{-3}$	CL=90%	2654	DESIG=13
$\eta \eta$		$< 1.5 \times 10^{-3}$	CL=90%	2627	DESIG=12
$\rho^0 \rho^0$		$< 3.20 \times 10^{-4}$	CL=90%	2569	DESIG=25
$\phi \rho^0$		$< 6.17 \times 10^{-4}$	CL=90%	2526	DESIG=28
$\phi \phi$		$(1.8 \pm 0.6) \times 10^{-5}$		2482	DESIG=30
$\pi^+ K^-$		$(5.5 \pm 0.6) \times 10^{-6}$		2659	DESIG=9
$K^+ K^-$		$(2.52 \pm 0.17) \times 10^{-5}$		2638	DESIG=10
$K^0 \bar{K}^0$		$< 6.6 \times 10^{-5}$	CL=90%	2637	DESIG=38
$\bar{K}^*(892)^0 \rho^0$		$< 7.67 \times 10^{-4}$	CL=90%	2550	DESIG=26
$\bar{K}^*(892)^0 K^*(892)^0$		$(2.8 \pm 0.7) \times 10^{-5}$		2531	DESIG=27
$\phi K^*(892)^0$		$< 1.013 \times 10^{-3}$	CL=90%	2507	DESIG=29
$p \bar{p}$		$< 5.9 \times 10^{-5}$	CL=90%	2514	DESIG=17
$\gamma \gamma$	B1	$< 8.7 \times 10^{-6}$	CL=90%	2683	DESIG=11
$\phi \gamma$		$(3.6 \pm 0.4) \times 10^{-5}$		2587	DESIG=18

Lepton Family number (LF) violating modes or $\Delta B = 1$ weak neutral current (B1) modes

NODE=S086;CLUMP=B

$\mu^+ \mu^-$	B1	$(3.2 \pm 1.5) \times 10^{-9}$		2681	DESIG=15
$e^+ e^-$	B1	$< 2.8 \times 10^{-7}$	CL=90%	2683	DESIG=20
$e^\pm \mu^\mp$	LF [b]	$< 2.0 \times 10^{-7}$	CL=90%	2682	DESIG=23
$\phi(1020) \mu^+ \mu^-$	B1	$(1.13 \pm 0.40) \times 10^{-6}$		2582	DESIG=31
$\phi \nu \bar{\nu}$	B1	$< 5.4 \times 10^{-3}$	CL=90%	2587	DESIG=19

B_s^*

$$I(J^P) = 0(1^-)$$

NODE=S087

I, J, P need confirmation. Quantum numbers shown are quark-model predictions.

$$\text{Mass } m = 5415.4^{+2.4}_{-2.1} \text{ MeV} \quad (S = 3.0)$$

$$m_{B_s^*} - m_{B_s} = 48.7^{+2.3}_{-2.1} \text{ MeV} \quad (S = 2.8)$$

NODE=S087M;DTYPE=M
 NODE=S087DM;DTYPE=D

B_s^* DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$B_s \gamma$	dominant	—

NODE=S087215;DESIG=1;OUR EST;
 → UNCHECKED ←

$B_{s1}(5830)^0$

$$I(J^P) = 0(1^+)$$

I, J, P need confirmation.

$$\text{Mass } m = 5828.7 \pm 0.4 \text{ MeV} \quad (S = 1.2)$$

$$m_{B_{s1}^0} - m_{B^{*+}} = 504.41 \pm 0.25 \text{ MeV}$$

NODE=M187
 NODE=M187M;DTYPE=M
 NODE=M187DM;DTYPE=D

$B_{s1}(5830)^0$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$B^{*+} K^-$	dominant	—

NODE=M187215;DESIG=1

$B_{s2}^*(5840)^0$

$$I(J^P) = 0(2^+)$$

I, J, P need confirmation.

$$\text{Mass } m = 5839.96 \pm 0.20 \text{ MeV}$$

$$m_{B_{s2}^{*0}} - m_{B_{s1}^0} = 10.5 \pm 0.6 \text{ MeV}$$

$$\text{Full width } \Gamma = 1.6 \pm 0.5 \text{ MeV}$$

NODE=M186
 NODE=M186M;DTYPE=M
 NODE=M186DM;DTYPE=D
 NODE=M186W;DTYPE=G

$B_{s2}^*(5840)^0$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$B^+ K^-$	dominant	253

NODE=M186215;DESIG=1

NOTES

[a] Not a pure measurement. See note at head of B_s^0 Decay Modes.

LINKAGE=X86

[b] The value is for the sum of the charge states or particle/antiparticle states indicated.

LINKAGE=SG